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STUDY PROJECT

GENIUS REVISITED: HUMAN ASPECTS OF COMMAND AND CONTROL

BY

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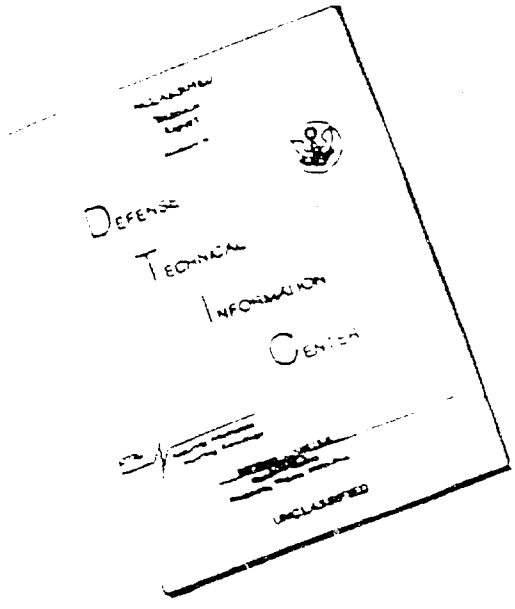

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Command and control on today's battlefield is a complex process that integrates facilities, equipment, procedures and people into a network to support the military commander. People are the most important part of that process, and the commander is the most important person. Clausewitz introduced the concept of military genius in On War, highlighting those traits necessary in the commander to achieve that genius. The study examines those intellectual and temperamental traits necessary on today's battlefield, relating them to key decision points in the command and control process. The importance of human interaction throughout the command and control process is discussed in light of the myriad of informational, operational and organizational decisions required of the commander within and about the process. Finally, the implications of human aspects of command and control for the future U.S. Army considering force and budget reductions are presented.

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GENIUS REVISITED: HUMAN ASPECTS OF COMMAND AND CONTROL

AN INDIVIDUAL STUDY PROJECT

by

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ABSTRACT

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Command and control on today's battlefield is a complex process that integrates facilities, equipment, procedures and people into a network to support the military commander. People are the most important part of that process, and the commander is the most important person. Clausewitz introduced the concept of military genius in On War, highlighting those traits necessary in the commander to achieve that genius. The study examines those intellectual and temperamental traits necessary on today's battlefield, relating them to key decision points in the command and control process. The importance of human interaction throughout the command and control process is discussed in light of the myriad of informational, operational and organizational decisions required of the commander within and about the process. Finally, the implications of human aspects of command and control for the future U.S. Army considering force and budget reductions are presented.

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CHAPTER 1

INTRODUCTION

People are the most important part of any command and control system; and the commander is the most important person. Statements of the obvious? Perhaps, but concepts that are seemingly misunderstood, and often overlooked or ignored, in our quest for the perfect "system" to ensure quality decisions on the battlefield and the faithful execution of those decisions. In a world so focused on technology and its possibilities, human aspects of command and control are often overlooked even though they remain critical, even decisive. Clausewitz's requirement for genius in the commander is as important today as it was in Napoleon's time, perhaps more so. As we draw down the Army in combination with reduced budgets, the opportunity for technological solutions to our command and control inadequacies becomes more and more limited. Increasingly we will have to rely on other elements of the command and control process to improve our overall decision-action capabilities. The human aspect of command and control is a vein rich for the mining. Understanding these human aspects in the command and control process and their implications for the Army of the future is the focus of this paper.

CLAUSEWITZ TO COMPUTERS --
PROGRESS IN COMMAND AND CONTROL

While much has changed on the battlefield since Clausewitz recorded his observations on warfare, much has stayed the same. The underlying nature of war, and the importance of the ability of humans to cope in this environment, remains unchanged. The battlefield today is the realm of danger, exertion and uncertainty just as it was when Clausewitz was gleaning his concepts for his monumental tome On War. Moreover, the personal roles and responsibilities of the commander are essentially unchanged from the time of Napoleon. What has changed are certain time and distance factors facing commanders which have been brought about by the tremendous and continuous advances in weapons system speed, range, complexity and lethality. The changes have prompted corresponding growth and changes in command and control support systems in an effort to help the commander manage chaos on the battlefield.

Clausewitz formulated his concepts about the nature of war while "learning at the master's knee" so to speak. The chaos that reigned on the Napoleonic battlefield was an order of magnitude greater than that previously known; caused by broader fronts of coordinated non-linear operations conducted by a flexible, decentralized Corps organization, increased firepower, and an overall mobility doctrine. Unfortunately, the commander was essentially without means or support to command and control this newly capable organization. The totality of the command and

control process rested in the person of the commander. It is easy to see why Napoleon believed that success in such circumstances required a person of "superior understanding";[1] and why in Clausewitz's thinking such a unique capability was required that he termed it military "genius".[2] No ordinary person could be expected to successfully command and control major forces amid the danger, exertion and, in particular, the uncertainty of the "modern" battlefield. Napoleon's genius lay in his ability to respond and manage the chaos and operate effectively in the environment of uncertainty. Without the ability to institute technological change, he was forced to turn to organizational changes; calling for self-contained, mission-oriented units, a system of regular reports, the organization of an initial headquarter's staff to manage the reports, and the concept of staff adjutants as "directed telescopes" to seek out critical information and act as couriers for the commander.[3] This first attempt at a command and control system, unleashed the true capabilities of the organization and allowed the decentralized concept to work.

The implications of this concept have not been lost on the world's militaries. Beginning with the development of the Prussian headquarters staff system and progressing right up to today's incredible web of sensors, spy and communications satellites, and information processing, battlefield operating and decision support systems, we have sought that magic combination of organization, procedures and technology necessary to eliminate the need for human genius in war. It sometimes seems that we

inputs that have led to the very real phenomenon of the commander being "data rich and information poor." The uncertainty on today's battlefield is potentially greater than ever before despite, or perhaps because of, the advanced support systems available. Consequently, whereas the military genius of Clausewitz's time represented the totality of the command and control process and that commander was prized primarily for his operational decisions in the face of the enemy, today's commander operates within a very complex command and control process; and how well he makes a myriad of decisions within, and about, that process may well determine the level of his genius. Professor Frank Snyder of the Naval War College highlights the increasing decision requirements of the commander throughout the command and control process and categorizes these command decisions into three basic types -- informational, operational, and organizational -- that permeate the process.[5] This concept will help form the framework for discussion throughout this paper.

THE GENERIC COMMAND AND CONTROL PROCESS

Today's commander operates within a very complex array of people, procedures, facilities, communications and equipment that compose his command and control system. Nevertheless, the basic nature of the command and control process is very simple in concept. In its most basic form the process has the three actions of seeing, deciding and acting. In recent years the

study of command and control has generated a multitude of models of this basic decision - action cycle. Figures 1 and 2 (Appendix) are a portrayal of the process developed by the author as part of an overall study attempting to help provide insights into introducing C^3I play in war-gaming.[6] The figures depict the command and control process in modular form (amenable to computer modeling at different levels of detail) comprised of the major functions or subprocesses of Information Management, Decision Management and Execution Management (Seeing, Deciding and Acting), along with a representation of the interaction of the commander and his staff. Although it was never intended for such a purpose, the architecture provides a useful tool for discussing certain human aspects of the command and control process.

While developing the architecture it became clear that there were two key subprocesses within the overall command and control process that did not properly fall directly within one of the three major functions. In each case these two key processes seemed to link, or form a hinge to connect, two of the major functions; both pictorially (see Figure 1), and functionally. Specifically, the complete efforts of one major process culminate in the presentation of a product requiring one of Snyder's command decisions; furthermore, the initiation and direction of the next major function "hinges" on the output (the decision made) of one of these two processes. Hence, these processes, the Situation Assessment and the Decision, are called "hinge pins" in the overall command and control process. Some would prefer to

call them linchpins, but I have resisted doing this since it is clear to me that the commander is the linchpin in this process, as will be seen as we progress through the rest of the study. Finally, it is at these two critical nodes in the command and control process that the creative and decisive talents of the humans in the process are the determining factors in the success of the overall process. The next two chapters discuss this idea in more detail.

CHAPTER 2

GENIUS AND THE INFORMATIONAL DECISION
(THE SITUATION ASSESSMENT)

The Situation Assessment is the first hinge pin in the command and control process, representing the culmination of the Information Management function and the stimulus for the Decision Management function. Here, often for the first time, the friendly and enemy situations are portrayed in a single picture and a conclusion is made as to the overall correlation of forces on the battlefield. This information decision, as Snyder would characterize it, is called the Perception of the Situation and it forms the basis on which all courses of action are developed.

UNCERTAINTY

The word "perception" is entirely appropriate because what is presented to the commander is not what is really happening on the battlefield at that instant in time. The extended distances involved on today's battlefield make the commander's personal reconnaissance extremely difficult. Perhaps more than ever, the commander is relying on an artificial vision (not reality) of the situation on the battlefield.[7] Moreover, the picture presented represents the conglomeration of reports that are phased over time, that are in varying stages of accuracy and that are variously filtered in traveling through the system. The result

is that the information can never be an entirely accurate portrayal of what truly is happening. As General Bruce Clarke would put it, "in battle, discount all good and bad reports by 50 percent -- then question the rest."[8] The results of Fort Leavenworth's Battle Command Training Program (BCTP), an intensive high level (division and higher) command post staff evaluation and training program, indicate that despite all the resources available today, accuracy is still wanting on the battlefield. At Division level the best staffs were about two hours behind ground or game truth, and the best Corps staffs were about four hours behind. Furthermore, there was a significant problem keeping everyone on the same sheet of music. Examination of what was thought to be the friendly task organization at any particular point in time showed major differences at various levels of command.[9] This would seem to be a relatively straightforward bookkeeping problem when compared with trying to keep up with the actual flow of what is happening on the battlefield. All this adds confusion and distortion, within the command and control process, to the chaos already on the battlefield. Today's sensor and information processing capabilities do not necessarily improve this situation and may even add to the problem.

The capabilities of overhead satellites and other sensors cause any sensible commander to attempt an effective deception plan. The presence of these capabilities, thus, may actually ensure that what appears to be happening is not what is happening at all. Furthermore, the detail of available intelligence

products may divert attention from the big picture of what may be happening. The tendency is to get bogged down in the details and not see the forest for the trees.

Additionally, the information processing problem facing today's commander and his staff is the opposite of that facing Napoleon. Whereas Napoleon normally was faced with a dearth of information about the friendly and enemy situation, today's commander is deluged with all varieties of "information" from battlefield reports, sensor data, national intelligence sources, etc. The result, however, is the same -- uncertainty.

The biggest source of uncertainty, however, is the same as it always has been, and that is the unpredictability of the enemy. The events of Operation Desert Storm highlight the problem. Who would have predicted the total lack of response from Saddam Hussein? Why was he sending his Air Force to Iran? Why did he refuse to withdraw his forces from Kuwait even as it became obvious they had almost no will or capability to resist? Besides the environment in which they operate, this unpredictability of the enemy is a primary difference between the military command and control process and any business decision-action process. The enemy commander's intent and concept are purposely hidden and can never be known with more than relative certainty. While modern automated systems may attempt to provide indications, it remains the realm of the human, the commander, to make the intuitive jump from what is presented as reality to what is, or at least is perceived to be, reality.

This lack of certainty is pervasive on the battlefield. So pervasive that Van Creveld asserts that:

> Command in war is essentially a quest for certainty -- certainty about the state and intentions of the enemy; certainty about multiple factors of the environment; certainty about the state, intentions and activities of one's own forces.[10]

Despite advances in support systems it still takes the human to interpret the information as he sees it and come to a conclusion as to the situation and intent of the enemy. Human genius is still required in the Situation Assessment and that genius takes much the same form today as it did in the day of Clausewitz.

INTUITION

Clausewitz talks about one element of military genius being the intellectual ability of the commander. In studying this portion of genius what he is pointing to is more of an intuitive capability. What he calls the "Coup d' oeil"[11] and what the Prussian/German staffs called the "fingerspitzengefuehl" (at the fingertip),[12] is an instinctive and creative ability required of the military genius. Instinctive from the point of view that decisions are required instantaneously in an environment of uncertainty, and creative from the point of view that the outcome represents the integration in the mind of the commander of a multitude of factors resulting in a sensible picture of what the enemy and his own troops are doing now and intend to do in the future. It is here, and in the operational decision, where the "art" of war enters. As with any artist, the commander takes the

raw materials of his trade, the battlefield information available, and makes the information decision as to what it means. Different commanders will make different interpretations of the same data. The genius of the commander is represented by the accuracy of his interpretations, and then, in the operational decision, how he reacts to that interpretation. Desert Storm again provides a reaffirmation of this concept. LTG Kelly, the Director of Operations for the Joint Staff, recently said in describing command and commanders, "It's more of an art than a science, and that's why some are more effective than others."[13]

It is important, then, to understand those elements that color the commander's judgment or more properly, his intuition. Figure 2 (Appendix) highlights some of those forces that push and pull on the commander during any decision he makes. His intuition, and hence the way he makes decisions, is very personal. It stems from many aspects not the least of which are his personality and psychological makeup, the historical perspective he brings to any situation, the training and doctrine he has received and employs, his understanding of the enemy, and a host of other elements. These forces represent a kind of non-real-time information source that, along with the real-time information on the battlefield, form the commander's base of information on which to decide. The commander builds this non-real-time base over time throughout his life. Roger Nye talks about three kinds of learning: specialization, professionalization and human growth,[14] all of which form the base and, hence, impact on the commander's intuition. He rightly

points out that "creativity occurs after the mind has been well honed and stacked with facts and ideas"; and that "everyone can improve their creative capacity with training."[15] The scene from the movie "Patton" where Patton is laying in wait to destroy Rommel's forces in the North African desert is instructive. As the German tanks fall into the trap Patton cries with glee "Rommel, you magnificent bastard, I read your book." His study in the past and his understanding of the enemy were key to his "hunch" as to what the enemy intended to do. These sources of non-real-time information and learning all impact on the commander as a decision maker, hopefully improving his intuition. Keegan says success is achieved when the commander is able to match the general knowledge of the past with the particular knowledge of the current situation.[16] The result is the blinding insight we all seek. The great commanders have all had this ability to sort through the confusion of reports, to aggregate these reports into a coherent whole, to see into the mind of the enemy commander and hence anticipate his actions. One writer on the subject characterizes this sixth sense, feel, or anticipation as the essence of decision making.[17] This assumes, of course, the requirement to act on that anticipation.

The importance of this information decision is obvious. All courses of action that the staff plans and develops generate from this decision. This decision and whatever colors it will affect the rest of the decision making process. Contrast the Patton example with Halsey's potentially disastrous situation assessment at Leyte Gulf. His misperception of the enemy intent caused him

to go on a dangerous wild goose chase, leaving the rest of the allied force high, dry and uncovered. Only good fortune and a corresponding misperception by the Japanese commander, Admiral Kurita, spared the almost defenseless American amphibious forces.

Ideally, the Situation Assessment results in a common perception of the battlefield, thus focusing the efforts of the staff on what is critical in fleshing out the courses of action to be developed. In a sense it acts like the commander's intent in getting all players on the same sheet of music in terms of planning and concept evaluation. Because of the creative and intuitive capabilities required in this critical step in the command and control process, and because of its importance, the Situation Assessment is, and must be, the realm of the human. The best way to improve command and control at this critical point is to improve the interaction of the people in the process.

COMMANDER AND STAFF INTERACTION

Given today's information processing technology, the human has clearly become the determining factor in how fast the command and control process can function. Information can be presented at an almost infinite rate in infinitesimal time. Every individual, however, has a finite capacity to process information. Similarly, every individual has a level of certainty, a comfort level if you will, at which he is willing to make decisions. Often, it seems, there is a single kernel of information that is essential to a commander's understanding of

what is happening on the battlefield. When that kernel is presented he will have that blinding flash of intuition that is founded on that base of non-real-time information mentioned earlier. Until that kernel is found, or that comfort level is reached, each person hesitates to make a decision. Only the pressure of time will force most commanders to act without reaching that comfort level, and then they will naturally be uncomfortable with the quality of the decision. The key, then, is to find ways to reach and maintain that comfort level as quickly as possible on the battlefield. The answer lies in the understanding between the commander and his staff.

In successful units the staff instinctively knows what is and is not important to the commander. Oftentimes the commander himself does not know what it is he needs to know to reach his comfort level of certainty. It is likely that what he specifies as his Commander's Critical Information Requirements (CCIR) do not always cover all key pieces of information. What happens is, over time, each staff officer learns the critical kernels of information for his particular area of expertise. Then, the good staff officer actively seeks those essential elements of information and becomes what Van Creveld calls a "directed telescope"[19] for the commander. At the same time the good staff officer must act as an effective filter for the commander. Given the mass of data available, the worst thing would be to provide any commander all the information available. The staff officer must sort through the data available and, using his best judgment and the criteria at hand, cull out those pieces critical

to the commander. What we have, then, is a human tailoring of the command and control process through organization, procedures and personalities to best meet the needs of the commander.

Everyone is familiar with the initial agony of adjusting to a new commander. Often this transition is anticipated with dread by both the commander and his subordinates. In fact, however, this is the beauty of the human aspect of the command and control process. Whereas we can never build a standard system that will meet the needs of every battlefield commander, the human can adapt to meet these needs; and the effectiveness of a unit is directly proportional to its ability to come to this synergistic relationship among the commander, his staff, and superior and subordinate units. It is useful again to refer to the example of Patton. At the beginning of the world war his staff was considered one of the weakest and by the end was considered one of the best. It is often said that no other staff could have planned and executed the turning movement resulting in the counterattack at the Battle of the Bulge.[20] Did each individual become that much better in his trade? Probably not in an absolute sense. Instead each individual, and the staff collectively, became better attuned to the Patton style and could anticipate his needs and desires. In a sense they shared his intuition and began to think much like him. At the same time, he gained confidence in his staff which resulted in both parties gaining increased freedom of action. In particular, this freed Patton from the details of managing the staff, allowed him to tour the front and see reality himself, and, ultimately, freed

him to let his creativity flow resulting in the apparent genius he possessed.

Given enough time almost any staff can adjust to the needs of a particular commander. Unfortunately, the process is often long and painful. In order to reduce this time lag it is incumbent on the commander to get actively involved in his information management function early to tailor it to best suit his needs. The process must serve the commander and not vice versa. Just as he tailors forces to meet the mission at hand, he must tailor the information processing function such that it presents the information he needs to reach his certainty comfort level. The effective interaction of the humans in the process can then present a picture at the Situation Assessment that results in the most accurate perception of what is happening on the battlefield.

CHAPTER 3

GENIUS AND THE OPERATIONAL DECISION
(THE COMMANDER'S INTENT)

The second hinge pin in the command and control process is the Decision, at which the commander considers the courses of action presented by his staff in the Decision Management function, and decides on the course to be executed. This is the operational decision that has characterized the critical role of the commander throughout history and remains so today. Here the burden of command rests squarely on the single individual tasked and empowered with the fate of his nation's resources -- both equipment, and most importantly, people. Given the criticality of these decisions no computer will be allowed to make them. These decisions will always remain within the realm of the human military commander, and success depends to a great extent on the same traits of genius that Clausewitz espoused long ago. The military commander must have the intellect and the temperament to make the right decision and, given today's span of control, the ability to effectively pass on that concept. In short, he must have a vision and be able to communicate it.

INTUITION AND VISION

Just as with the Situation Assessment, the commander requires Clausewitz's coup d' oeil at the Decision. Moreover, at

the Decision the commander must go beyond intuition to vision in order to possess genius. By this it is meant that, besides having the intuition to see the intent of the enemy, the commander must have the vision to craft the concept that will defeat the enemy. This is the full extent of Clausewitz's intellectual aspect of genius. Again, as with the Situation Assessment, many non-real-time factors color the way in which the commander decides on a course of action. The same cast of factors, such as upbringing and historical perspective, will tend to move a commander toward a particular course of action, perhaps even one totally different from those presented by his staff. Here, however, the commander must call on additional creative abilities to build the concept of operations he wishes to execute. He must see the opportunities available and the best way to exploit those opportunities. The incredibly complex nature of today's battlefield strains these creative abilities to the maximum. At the same time, the commander must temper his desire to seize opportunities with a sense of reality about what is achievable. Again quoting Van Creveld:

> To know what one can do on the basis of available means, and to do it; to know what one cannot do, and refrain from trying; and to distinguish between the two -- that, after all, is the very definition of military greatness, as it is of human genius in general.[21]

The development of an effective campaign plan that accomplishes all this requires true vision.

TEMPERAMENT

Clausewitz talks about the temperament of the commander as a critical element in military genius.[22] Nowhere is that element more essential than at the Decision. One of the key personality traits of the commander is his propensity to make decisions. Is he a risk taker or a stoic? What is that kernel of information, based on his past, that will allow him to act decisively? As Clausewitz notes the burden of command weighs heavy on the commander at the time of decision.[23] Ultimately, the commander must make a human decision that affects human lives. And it takes the strongest mental capacity to make this type of decision amid the uncertainty of the battlefield. One need only consider the D-Day decision facing Eisenhower to understand this tremendous burden. One marvels at the moral courage and mental strength required to utter those fateful words, "Ok, let's go."[24]

Furthermore, significant will and determination is required to stay the course once the decision is made; especially in today's age of instant communications and information processing whose capabilities can inject one or another of what Van Creveld might call "information pathologies."[25]

The speed of communications on today's battlefield can cause individual incidents to take on greater significance than perhaps they deserve. All commanders today are well enough versed in Clausewitz's fog of war to expect things to go wrong on the battlefield. Nevertheless, as each new spot report arrives the

tendency may be to overreact and stray from the original decision. The constant barrage of information can cause the commander to question his original judgment and nothing is worse on a unit than a constant changing of plans. Moreover, there are any number of external forces pulling at the commander's determination, including the fact that today's commander must consider domestic and international politics. The impact of the SCUD missile attacks during Operation Desert Storm is an excellent example. The tremendous pressures of the media and public opinion fixed the attention of all despite the attack's "military insignificance." It takes superior strength of will and confidence to stick to the plan under such pressures.

On the other hand, it also takes a superior strength of character to know when to change course or move away from a losing concept. Today's advanced systems can have an impact here also. Unless carefully filtered and controlled, the flood of data from information processing systems can overload the commander, with the potential result being decision paralysis. What information is right and what is wrong? What role does deception play? What is the overall level of uncertainty of the perception drawn? What is the critical event that will cause the commander to change course? How does the commander know? The tendency may be to not decide anything because things are too confusing to determine what way to go.

Referring again to Operation Desert Storm, even the news media got a sense of the effect of this information overload.

During the first hours and days of the operation, "the networks' star anchors . . . spent long hours . . . trying to manage a bombardment of information that was often sketchy, sometimes confusing, ultimately numbing . . . ."[26] Consider the enormity of the task facing the commander when he must decide and act on this information, rather than merely report it. Clausewitz's requirements for military genius remain today as much as ever.

COMMANDER'S INTENT/CONCEPT OF OPERATIONS

The Decision, then, represents the epitome of the commander's responsibility, requiring all the traits of military genius. As with the Situation Assessment, the nature of the Decision drives the remainder of the command and control process. The importance of the commander's intent and the concept of operations may seem obvious but it cannot be overstressed; and their impact on the human aspects of command and control is critical.

We have developed the concept of the "Commander's Intent" in an effort to clarify and simplify activities on the battlefield. Its beauty lies in the fact that it focuses the humans at every level in the process on the ultimate goal without restricting their freedom of action. In this respect it makes a perfect fit with the key concepts of the U.S. Army's current air-land battle doctrine.

The commander's intent and its companion, the concept of operations, describe the desired outcome on the battlefield at

the end of the campaign, and the general tactic to achieve that outcome. In doing so, they direct the staff's efforts in orders preparation; facilitate a common understanding of the final state of actions in war; clarify the reasons for any restrictions or rules of engagement; and, in general, foster an improved mutual understanding of the mission at all levels of command. This understanding generates improved trust and confidence up and down the chain of command, enhancing the ability to operate without real-time communications at all levels of command. Less reporting is required and communications channels are freed for critical reports that can then be classified as exactly that, critical information. Commanders at all levels are freed to command instead of report, and the entire command and control process is enhanced, merely by the clear understanding at all levels of the ultimate goal of the operations.

At the same time, individual initiative is improved. Within the general guidelines of the commander's intent, each level of command operates freely to accomplish its assigned mission. The command and control process at every level is simplified and cycles faster, thus significantly improving the overall process. Rather than relying on real-time communications we are in fact reducing the need for them. The result is a tremendously flexible organization and the achievement, in reality, of the critical doctrinal tenets of agility and initiative.

Furthermore, the concept of operations impacts the achievement of synchronization of forces in direct proportion to the creativity (read genius) of the commander. Synchronization

is absolutely critical on today's complex battlefield. Today's military commander faces order-of-magnitude changes similar to those facing Napoleon. Operations are coordinated over broader fronts than ever, if fronts exist at all. Weapons systems have greater range, accuracy, and lethality than ever. The overall speed and danger of modern warfare demand that the commander be able to bring the maximum combined-arms power to bear at a specific place and time. In other words, the commander must synchronize his operational forces at the critical juncture for maximum effect. General William DuPuy characterizes the concept of operations as the key to synchronization and the single most important creative act of the commander.[27]

When carefully considered, one can envision a dichotomy between the concept of operations and the commander's intent. Synchronization on the battlefield may require a specificity of direction that conflicts with the freedom of action implied in the generality of the commander's intent. For maximum effect the commander must carefully balance the need for control and coordination with the imperatives of initiative and agility. The ability to maintain this precarious balance determines to a great extent, the genius of today's commander. The concept of operations and the commander's intent, two human products of the command and control process, have the greatest impact on success on the battlefield.

CHAPTER 4

GENIUS AND THE ORGANIZATIONAL DECISION
(TAILORING THE COMMAND AND CONTROL PROCESS)

The Situation Assessment and the Decision may be the most personal test of the commander's intuition and vision, but his impact must be felt throughout the command and control process if true genius is to be achieved. The commander must tailor the process to meet his needs, and his understanding of the human aspects in it can be critical to success.

THE COMMANDER AND HIS STAFF

The interaction between the commander and his staff is replete with the human aspects of command and control. The staff's impact throughout the process should not be underestimated. The staff interprets and transmits the commander's guidance to subordinates and superiors and represents the commander in nearly every respect. Because of its importance as this channel of communications, and its role as a "window" for the commander, the relationship of the commander and his staff is obviously critical.[28] The staff must understand the commander and his personality quirks and the commander must understand the capabilities of his staff. This relationship has been described in some cases as a kind of "family" relationship.

Moltke described his headquarters as:

> not so much a formal structure in which each member had his well-entrenched niche and sphere of responsibility as an informal gathering of friends, meeting regularly once a day and taking their meals together whenever possible.[29]

Eisenhower's staff is well known to have had a similarly close relationship. While Patton's and MacArthur's staffs might not be described as a family, each staff clearly learned to meet the needs of its commander and became an effective extension of that commander. The better the staff understands the commander, the better it can anticipate his needs, the better it can serve as a directed telescope seeking out those critical kernels of information, and the better it can filter all data coming into the headquarters. The staff can even serve to fill gaps or blind spots in the commander's perceptions in some respects. It must be recognized, however, that the same kinds of forces that color the commander's intuition and decision making processes color each member of his staff. Hence, the filtering that each member does, and the information he presents to the commander, is tainted by that staff officer's personality, upbringing and training.

The degree to which the staff can succeed depends to a great extent on the activity of the staff. Van Creveld points to the success of the Moltke staff as deriving from two significant traits -- the willingness to recognize a problem and the determination to solve it.[30] These traits track very closely the traits of command genius discussed earlier; that is, the commander's intuition and temperament (will and determination).

Hence, the staff must take on the true elements of the extension of the commander. The staff must be active in seeking to support the commander's information needs without being intrusive in the affairs of the subordinate commands.

The staff also serves others in providing a window to the commander's intentions and desires. In this regard the credibility of the staff becomes critical. Clarke talks about the need for the staff officer to understand soldiers and the environment of the battlefield and that if he does not, "he can be very dangerous to the troops."[31] Similarly, Keegan speaks of the "imperative of kinship" needed between the commander and the soldier. This is the concept that, "those who are asked to die must not be left to feel that they die alone."[32] At the same time, many commanders feel the real need to maintain a certain distance or aloofness and, perhaps, to inject a sense of mystification. The staff must share the imperative of kinship, and can serve to mediate any commander's aloofness with respect to soldiers or subordinate commanders, thus helping him to meet his imperative of kinship.

Keegan talks of acting as a "diaphragm of intimates and associates which surround the commander."[33] While serving to raise the comfort level of the commander, the staff can also serve the rest of the command. In the same vein, the staff can serve to provide an important informal channel of communications. This informal channel can be, and normally is, a critical augmentation and clarification means for formal reports and command communications.

The opposite is also obviously true. The staff can serve to isolate the commander from subordinates and the reality of the battlefield by serving as gatekeepers and information filters. Hence, the orientation of the staff must match that of the commander for the positive aspects to occur. All of these human interactions can serve to enhance or detract from the command and control process, and their effectiveness is directly proportional to the quality of the staff and its understanding of the commander.

The bottom line for the staff must be to reduce the uncertainty of the commander and correspondingly increase his comfort level. It is no fluke that some of the best staffs have described their relationship as a family-like atmosphere. This close knit relationship builds over time to the point where certain coordination is not needed, where the needs of other staff elements are anticipated, where a level of trust and confidence is reached among the staff and with the commander that can only be reached as in a family. Nothing can replace the elements of stability and time in the staff to improve the human aspects of the relationship between the commander and his staff. The advantages of stability permeate throughout the chain of command in providing a lubricant to improve the command and control process.

Finally, the importance of the chief of staff should not be overlooked in the process. Perhaps no other individual, except the commander, is more important in the process in ensuring that the staff understands and meets the needs of the commander.

Additionally, the chief of staff sets the tone and the operating procedures for the staff; and in doing so, goes a long way to setting the climate of the headquarters. Furthermore, he is the chief gatekeeper, determining to a great extent what information the commander sees. History has many examples of great chiefs of staff and their impact in freeing the commander to exercise his genius. Eisenhower's "Beetle" Smith immediately comes to mind and even the great Napoleon during the battle of Waterloo despaired at the loss of his Berthier. Montgomery when asked to list the attributes of a good general gave as the number one imperative to "have a good chief of staff."[34] The closeness of the relationship between the commander and his chief of staff is critical to the effectiveness of the command and control process.

SUBORDINATE COMMANDERS

Ultimately the commander's concept must be executed by his subordinates. The relationship between the commander and his subordinate commanders is critical to the success of the mission and can influence the command and control process. The degree of common perception of the situation, and the level of common understanding of the commander's intent, both affect the level of trust and confidence between commanders. This same trust and confidence can influence the missions assigned by the commander to certain subordinates. Additionally, the predisposition and biases of subordinates affect their reception of orders and, hence their understanding of the commander's intent. It is

incumbent on the commander to understand these traits of his subordinates in order to make the most of his command and control system. As one writer on the subject puts it, "It is the interpretation that matters, not what you think you said."[35] The effective commander may have to tailor the means he uses in communicating with different subordinates. One may work fine with a verbal order, another may need written guidance, a third a personal visit. Again, consider the complexities facing Eisenhower in dealing with the vastly different personalities of Bradley, Montgomery and Patton, and the way he had to communicate his intent in order that there be no misinterpretation. The genius of the commander is in knowing what is the most effective means for each and understanding the impact on command and control.

The discussion of personalities, brings to mind the idea of access when dealing with subordinate commanders. The trust and confidence the commander has in a subordinate will affect the missions given that commander and, unfortunately, perhaps even the resources provided. The argument is often made, for example, that MacArthur relieved Harding in New Guinea and replaced him with Eichelberger purely based on personalities. The argument goes on that Eichelberger received reinforcements and provisions that Harding had asked for and never received, and that these reinforcements were decisive. The purported difference was that Eichelberger enjoyed the trust and confidence of MacArthur and, hence, had an access that Harding never enjoyed. Reports from

Harding were received with suspicion while Eichelberger's were taken at face value.[36]

Trust and confidence have a significant impact on the command and control process. Extending the thought process farther, one could make a credible argument that personalities, more than any other factor affected the organization of command and control, and interservice communications at the highest levels (e.g., MacArthur, Nimitz, Halsey, etc), in the Pacific Theater in World War II. Accounting for the impact of personalities is difficult but understanding its impact on the command and control process is important.

One way to account for it is to maintain an informal network of communications among headquarters and between the commander and his executing commanders. Success on the battlefield is too important to allow personalities to significantly detract from this success. The trend toward formal and standardized languages in information processing systems was designed to allow automation in processing. However, the result has been a shift toward trivializing the information being provided.[37] While beneficial to the computer, and useful in tracking logistics type information, systems such as JINTACCS (Joint Interoperability of Tactical Command and Control Systems) have met great resistance from commanders because of the depersonalization of communications they represent.[38] Leaders feel the need for access to the boss to tell him in their own words how things are going. And the boss should feel the need for personal

assessments from his subordinates as to the impact of his orders and instructions. This need for human interaction in the command and control process is very real and must be accounted for.

PROCEDURES AND ORGANIZATION

In tailoring his command and control process the commander needs to consider procedures and organization and their impact on the process. We have already discussed the importance of the chief of staff in establishing the headquarter's procedures. In a similar way Standing Operating Procedures can impact the entire command and its command and control process. The definition of reporting thresholds and required reports, the Commander's Critical Information Requirements and the allocation of assets to retrieve them, and the means and methods of transmitting orders all impact the volume and type of information flowing in the command and control process. Hopefully, these procedures are designed to support the comfort level of the commander and not that of some staff officer. More often than not, however, they are not carefully "designed" at all; resulting from years of tradition without scrutiny. The goal should be for the staff to become an effective directed telescope for the commander without being an intrusive element in subordinate commands. The active involvement of the commander in developing these procedures can help to ensure they truly meet his needs and at the same time reduce the common antagonism among staffs at all levels of command.

CENTRALIZATION OR DECENTRALIZATION

One of the biggest questions that needs to be answered by the commander in tailoring his command and control process is the question of centralization versus decentralization. The capabilities of today's communications and data processing systems provide the ability for an unprecedented degree of centralization. However, the ability to centralize does not necessarily mean that one should. In fact the opposite may be the case.

Van Creveld makes the case that decision thresholds should be fixed as far down the hierarchy as possible with the consequent result being the need for an organization of self-contained and capable units at a fairly low level.[39] The thought process here is very similar to that mentioned in Chapter 3 when discussing the Commander's Intent. Assuming the executing commanders understand the commander's intent, they are in the best position to decide the best immediate course of action to achieve that intent. The key point is that the man who knows the most about the situation should be the one making the decisions affecting that situation. The result is the improvement of command and control at all levels and, hence, the most efficient and effective process overall. Each level demands and gets the information necessary to act at that level, no more no less. Each process cycles inside the enemy's decision-action cycle, and each unit achieves and maintains initiative and agility.

Unfortunately, the nature of warfare today militates against this decentralization and freedom of action. The speed, range and lethality of weapons systems have tended to move decision makers further from the front lines if there is a front at all. At the same time, the impact of the media and instant worldwide communications tends to turn tactical fights into "strategic" battles. Consider for example, the pitched Desert Storm press conferences, and second guessing by media "experts," surrounding the Iraqi "invasion" of Al Khafji and the Allied response to it. The result is the tendency to micro-manage even the most minor skirmish. The impact on the command and control process is significant -- flooding communications channels up and down the chain of command with demands for information and status, and the resulting intrusive orders.

The situation with the command and control processes in Vietnam is a perfect example of this "pathology," as Van Creveld describes it, and it is "almost enough to make one despair of human reason."[40] The problem, however, is not always easy to detect and even the best of organizations can be infected if their commanders are not vigilant. Again turning to Van Creveld, he paints a vivid picture of what he terms "reverse optional control" in the Israeli forces during the Arab-Israeli War of 1973.[41] Whereas the Israelis had always prided themselves in the initiative and independence of their front line commanders, the reality was that decisions were forced to the highest levels and were being made in Tel Aviv as far away from the front as possible. Worse, however, was the fact that because

communications channels were inadequate, the decision-makers were able to communicate effectively with superiors but not subordinates. Because they lacked trust and confidence in their front line commanders, they had reserved nearly all decisions to themselves. Thus, the men who knew the least were making the crucial decisions, and these decisions were not reaching the executing commanders in a timely fashion. Although the Israelis won the war, it was not because of superior command and control.

One of the problems with centralization is the fact that "greater certainty at the top is gained at the expense of less certainty at the bottom."[42] The constant demand for information up the chain clogs communications channels and overburdens subordinate staffs. Subordinate commanders and staffs focus on reporting and not the problem immediately facing them. With the constant upward focus all command levels tend to ignore providing important information to subordinates, and these subordinates are forced outside the normal command and control channels to seek their information needs. Again the result is a serious distortion of the desired and expected process, perhaps without the understanding of the commanders involved.

The discussion in Chapter 3 concerning the commander's intent and the concept of operations (initiative, agility, and synchronization) amounts to a subset of the overall question of centralization versus decentralization. In a similar fashion to the conclusion drawn there, the commander must balance his need for certainty, and hence his desire for centralization, with the

benefits of decentralization, certainty and freedom of action at lower echelons. The genius of today must recognize the impact of these human decisions and interactions on the command and control process and tailor his process to provide the proper balance of centralization and, hence, certainty at all command levels.

CHAPTER 5

IMPLICATIONS AND CONCLUSION

A clear understanding of the human aspects of command and control leads to many implications. This chapter will discuss a few from the point of view of policy in the personnel, training and procurement areas.

PERSONNEL

As the U.S. Army draws down its forces and repositions itself as a CONUS-based force, opportunities will be available to improve human aspects of command and control that a larger, forward-based force prevented. The major implication of these combined events will be the opportunity for increased stability in the force. Short and long overseas tour equity will not be an overriding consideration. Moreover, the remaining installations, both stateside and overseas, should be the best available, and hence, very desirable. Regardless of the rhetoric to date, promotion rates will likely slow, and pressures to ticket punch will be reduced because there will be more time to meet professional development requirements. The need for frequent moves will correspondingly be reduced and this increased stability will have a beneficial impact on command and control.

Increased stability offers the opportunity for commanders, staffs and subordinates to develop the close relationships that ease communications and coordination, improve understanding at

all levels of command and, thus, smooth the command and control process. Currently, at nearly all levels of command the commander is the stability of the organization. Staff and command subordinates come and go while the commander remains, and must continuously train his people to match his way of doing business. The unfortunate result is that the commander is continually rehashing old ground and cannot move his unit to the next level of excellence. The commander becomes focused on the here and now and cannot be forward looking. This constant parade of new personalities disrupts effective command and control. While the Army has instituted the rudiments of a regimental system and cohort units, and has looked longingly at the British system, it has never fully implemented these concepts because of personnel policy implications. The drawdown offers an opportunity to do just that, with all the benefits of cohesion that that system has always envisioned.

A second area that needs to be looked at is allowing commanders to choose their subordinates. In particular at the higher tactical and the operational levels, the commander should have the ability to select key staff principals. As a minimum, the commander of division level units and higher should be allowed to choose the chief of staff. The importance of this prerogative in improving the commander's comfort level on the battlefield, and in peacetime planning for war, is significant to the improvement of his decision making capabilities. Of course there is always the danger of introducing "group think" into our units. However, the enhanced effectiveness and efficiency

wrought during the immediate stages of wartime are worth the risk. Given the instability of the world, it seems prudent to provide commanders on a continuing basis the principals they would ask for in war. In doing so readiness is enhanced for these ever more likely "come-as-you-are" wars. The impact on common understanding of the commander's intent in peacetime training and in wartime would be dramatic. Similarly dramatic would be the reduction in need for real-time communications, the improvement in staff coordination, and the increase in informal communications networks with the resulting mutual understanding among levels of command. When needed, the command and control process will be in place and smoothly functioning, and the commander will have increased certainty and comfort.

TRAINING

Force and budget reductions are already having a significant impact on training throughout the military. The number and size of major exercises is reducing drastically and the ability to maneuver freely is continuously dwindling. In fact many leaders have indicated that maneuver outside the major combat maneuver training centers will be limited to battalion sized elements or less. Nevertheless, this is not all bad news. Recent innovations in training and exercise design, such as the previously mentioned Battle Command Training Program and increased exercise simulation, offer tremendous opportunities for improving command and control processes.

The focus of command and control training should be the improvement of staff procedures and coordination and the improvement of commander and staff interaction. The goal should be to put the commander and staff in a realistically stressful situation and force their decision-action processes to act under that stress; maybe not the stress of a combat environment, but stress nonetheless. This has been the focus of the Battle Command Training Program,[43] for example, and the most recent REFORGER exercise, and represents the trend of the future. This high level command post exercise, supported by realistic simulation, is exactly the type exercise most effective in developing the relationships among the commander, his staff and subordinates so key to improving the human aspects of command and control. The interaction is real and the staff becomes attuned to the information needs of the commander and his decision-making style. They learn to anticipate his needs and become effective directed telescopes. In REFORGER '90 the realism was enhanced by using the actual tactical communications networks to connect displaced headquarters elements, and simulations were updated based on the information passed over these networks. In doing so some of the fog of war was injected into the process.

In the future, this type of exercise seems to offer the most promise, especially at the upper levels of command; Division and higher. In a very short period of time this intense experience can significantly help to meld the participating units into an effective team. One key to success, however, is the active participation of the commander. He cannot sit back and be a

dispassionate observer. He must get involved just as he would in combat. Otherwise the staff and subordinates will not understand his full intent and will often move in their own directions. Only his active participation will ensure that all are pulling in the direction he wants them to go.

This same active involvement must extend to the development of periodic training guidance. Everything the unit does should be focused in accordance with the priorities and perceptions of the commander. In doing so, he shows the command what he considers important and gives them an insight into the workings of his thought processes. If he sits idly by the command becomes focused toward the priorities of someone else. However, given the active engagement of all concerned, the command and control process will continue to improve and be effective when needed in wartime.

From an individual training and development perspective, the focus should be to develop leaders who learn to operate effectively in an environment of uncertainty. Creating future genius demands that the Army begin strategic leader training early in each officer's career. One way to learn the basics is to study those who have been successful in the past. Some advanced courses are initiating directed reading programs in the great captains of the past, and this is a step in the right direction. A staple of the Command and General Staff and War Colleges, it should be done across the board, to include unit level Officer Development Programs. At unit level, study and reflection of the leaders and campaigns of the past can help

focus on the key elements of command and control, and enhance unit understanding and cohesion. Finally, consideration should be given to the development of some sort of creativity training for the officer corps. Perry Smith highlights such programs as those developed at the Center for Creative Leadership and the Center for Excellence in Government as opportunities to develop this ability in military personnel as well as business executives.[44] As an officer progresses through a career in the military this mental agility becomes more and more important, and anything that can be done to improve this aspect will be worthwhile.

SYSTEM DESIGN AND DEVELOPMENT

As indicated in the introduction, the search continues for the perfect system of command and control in an attempt to alleviate the need for genius on the battlefield. And since the advent of automation, the Army has focused on its potential as the solution. This approach has led to frustration on the part of the developers and field commanders alike. The reason is a fundamental misunderstanding of the importance of the human at the critical points in the process, for example the Situation Assessment and the Decision. This is not to say that the commander should not have all the support available; but it is to say that that support must be properly focused with an understanding of the best way to make the man-machine interface. All concerned must understand what command and control systems,

in particular decision support systems, can and cannot do, and develop them accordingly. This section provides some observations on command and control system design and development in light of the human aspects of command and control.

First, no automated system can account for the very nature of war. They ignore the fog of war and assume a perfect world. Most importantly, they cannot deal with the unpredictability of the enemy commander. Basically, automated decision support systems develop their recommendations based on some normative process or weighted probability to determine a best choice. While this form of decision making may work well in a business environment, with its relatively predictable outcomes, it will not work in a combat environment. The choice presented by this normative process may not even be possible or logical given the parameters of wartime.[45] Inevitably, the decision made in combat is an intuitive jump based on previous experience, study and training. No automated system can replicate this, nor should it. Automated systems cannot create a course of action, they can only reproduce one that has already been programmed. This difference in "thinking" processes is often the cause of the frustration with computer generated scenarios. Furthermore, the decisions on the battlefield are so critical that we will never relegate them to the realm of automation.

From the beginnings of automation it has been understood that the value of automation lies in the manipulation of vast amounts of data and the solution of routine algorithms. The value of automation in such arenas as logistics, and target

acquisition and display, is immeasurable. These areas of endeavor are inherently more certain and lend themselves to greater centralization. However, its utility in the critical areas of informational and operational decision making is limited and will remain so.

Furthermore, to expect to be able to centrally develop a common system flexible and adaptable enough to meet each commander's needs is folly. Were such a system available or capable of being built it could never be afforded. The U.S. Army's history with such developments proves the point. For example the Tactical Operations System died of its own weight because of an inability on the part of the combat developers to agree on a set of requirements. The only two areas that were absolutely agreed upon as required were the friendly and enemy situation. Unfortunately, it could not be agreed among the developers and test commanders what should be contained in those files and how that information should be presented. Every new commander said the system did not meet his needs and the data base design was constantly in flux. Just when the system neared utility in the eyes of one commander, someone took his place and the process restarted.[46]

After several attempts the community has come to the realization that the solution lies in evolutionary development of command and control systems. The greatest success is achieved when basic capabilities are put in the hands of the commanders and their staffs and they are allowed to tailor the basic systems to meet their individual needs. Interoperability can be

maintained by providing interface devices and standards to allow commands to work together at least at the file level. This is the approach taken by the USAREUR Tactical Command and Control System (UTACCS) which has been highly praised by all using it and was described by one senior system developer as what should be the prototype for all command and control system developments.[47]

Ultimately, then, in order to make the most of any command and control process, one must make the most of the individual elements of it. Systems do some things better than humans -- accumulate, store, process and display data. Humans do some things better than systems -- correlate and evaluate data, report and develop information, and, most importantly, make decisions. The key is to make the most of this man-machine interface and not to try to force one element to do the other's function.

CONCLUSION

Command and control has progressed from the primitive yet critical processes of Clausewitz's time, to the extremely sophisticated and complex network of processes and systems of today's battlefield. Despite the progress of command and control support systems, the nature of war remains the realm of danger, exertion and uncertainty. Because of these elements and the inherent friction involved with waging war, Clausewitz saw the need for genius in the military commander to successfully operate

in such an environment. The requirement for genius remains today.

Today's commander requires the same personal genius as always at the critical points in the command and control process, the Situation Assessment and the Decision. But today's military genius must also understand and tailor the overall command and control process. In particular, tailoring the many human aspects present throughout the process can have a significant impact in reducing the friction in the process, reducing uncertainty, and correspondingly raising the comfort level of the commander charged with the destiny of his nation.

As the U.S. Army reduces the size of the force in the face of budgetary pressures, it must find the most effective and efficient ways to improve its units, and in particular its commanders. The Army must ensure that its command and control systems and processes serve its commander's needs and not vice versa. The greatest resource is the adaptability of the humans in the process. A clear understanding of the interactions of this human element goes a long way toward making all commanders command and control geniuses.

ENDNOTES

1. Martin Van Creveld, Command in War, p. 267.

2. Carl Von Clausewitz, On War, p. 100.

3. Van Creveld, p. 97.

4. Ibid., p. 275.

5. Frank M. Snyder, "Command and Control and Decision Making," in Principles of Command and Control, ed. by Stephen J. Andriole and Jon L. Boyes, p. 18.

6. Patrick T. Thornton, Brian L. Raymond, and Edward F. Smith, Jr., Command and Control and Information Management, pp. 2-23.

7. John Keegan, The Mask of Command, p. 325.

8. Bruce C. Clarke, GEN, General Bruce C. Clarke: A Study in Leadership and Training, p. 4.

9. Interview with Steve Crawford, LTC, former BCTP staff officer and student U.S. Army War College, January 1991.

10. Van Creveld, p. 264.

11. Clausewitz, p. 102.

12. Roger H. Nye, The Challenge of Command, p. 72.

13. Thomas Kelly, LTG, Daily Pentagon Briefing, Operation Desert Storm, 5 February 1990.

14. Nye, p. 30.

15. Ibid., p. 72.

16. Keegan, p. 323.

17. Edgar F. Puryear, Jr., 19 Stars, pp. 361-367. Perry M. Smith, Taking Charge, p. .

18. U.S. Army War College Case Study, Leyte, 20 October -- 25 December 1944, pp. 30-39.

19. Van Creveld, p. 75.

20. Paul G. Munch, LTC, "Patton's Staff and the Battle of the Bulge," U.S. Army War College Course 1 Readings, Strategic Leadership, pp. 276-281.

21. Van Creveld, p. 102.

22. Clausewitz, pp. 102-104.

23. Ibid., p. 104.

24. U.S. Army Case Study, Operation Overlord, Volume 1, Introduction and Strategic Setting, p. 43.

25. Van Creveld, p. 258.

26. Richard Zoglin, "Live from the Middle East!," Time, January 28, 1991, p. 70.

27. William E. DePuy, GEN, "Concepts of Operation: The Heart of Command, The Tool of Doctrine," Army, August 1988, p.27.

28. Keegan, p. 317.

29. Van Creveld, p. 142.

30. Ibid., p. 144.

31. Clarke, p. 2.

32. Keegan, p. 315.

33. Ibid., p. 317.

34. Munch, p. 276.

35. H. F. Zeiner-Gundersen, "Reflections by a Soldier on Command, Control and Leadership," in Principles of Command and Control, ed. by Stephen J. Andriole and Jon L. Boyes, p. 45.

36. U.S. Army Case Study, The New Guinea Campaign: From Buna and Guadalcanal to the Isolation of Rabaul, pp.20-21.

37. Van Creveld, p. 273.

38. Author's personal experience and observation as Joint Staff Action Officer, July 1984 -- November 1987.

39. Van Creveld, pp. 270-271.

40. Ibid., pp. 258-260.

41. Ibid., pp. 226-231.

42. Ibid., p. 274.

43. Leonard P. Wishart III, LTG, "Leader Development and Command and Control," Military Review, July 1970, pp. 11-17.

44. Perry M. Smith, Taking Charge, pp. 243-247.

45. Marvin S. Cohen, "Models, Uncertainty, and Decision Aids," in Science of Command and Control: Coping With Uncertainty, ed. by Stuart E. Johnson and Alexander H. Levis, pp. 83-85.

46. Author's personal experience and observations as Tactical Operations System System Controller, March 1974-July 1976.

47. Author's personal observation during REFORGER 1990, January 1990.

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APPENDIX

This Appendix contains two figures that portray the command and control process as developed by the autor during a previous study project.

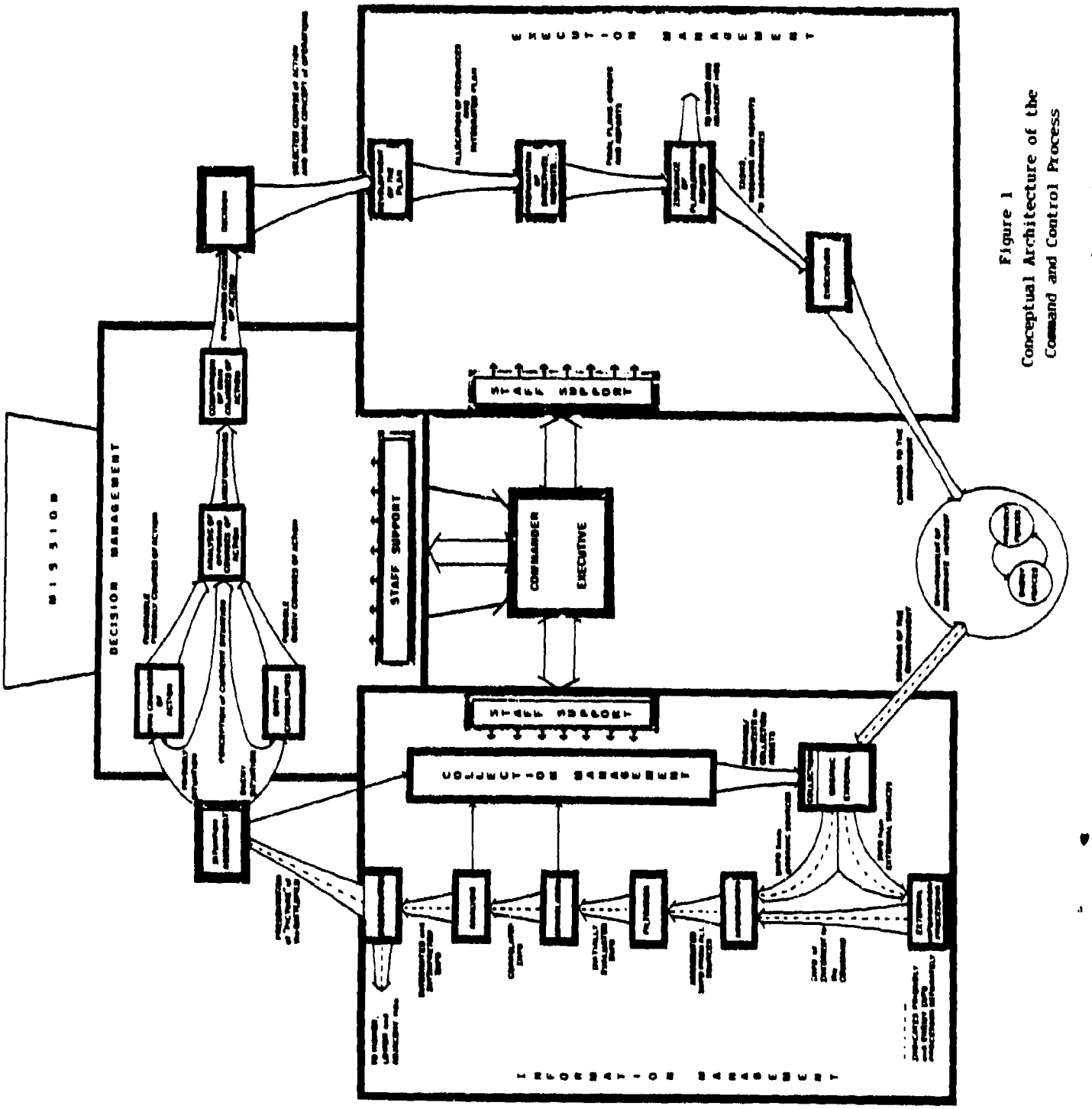

Figure 1
Conceptual Architecture of the
Command and Control Process

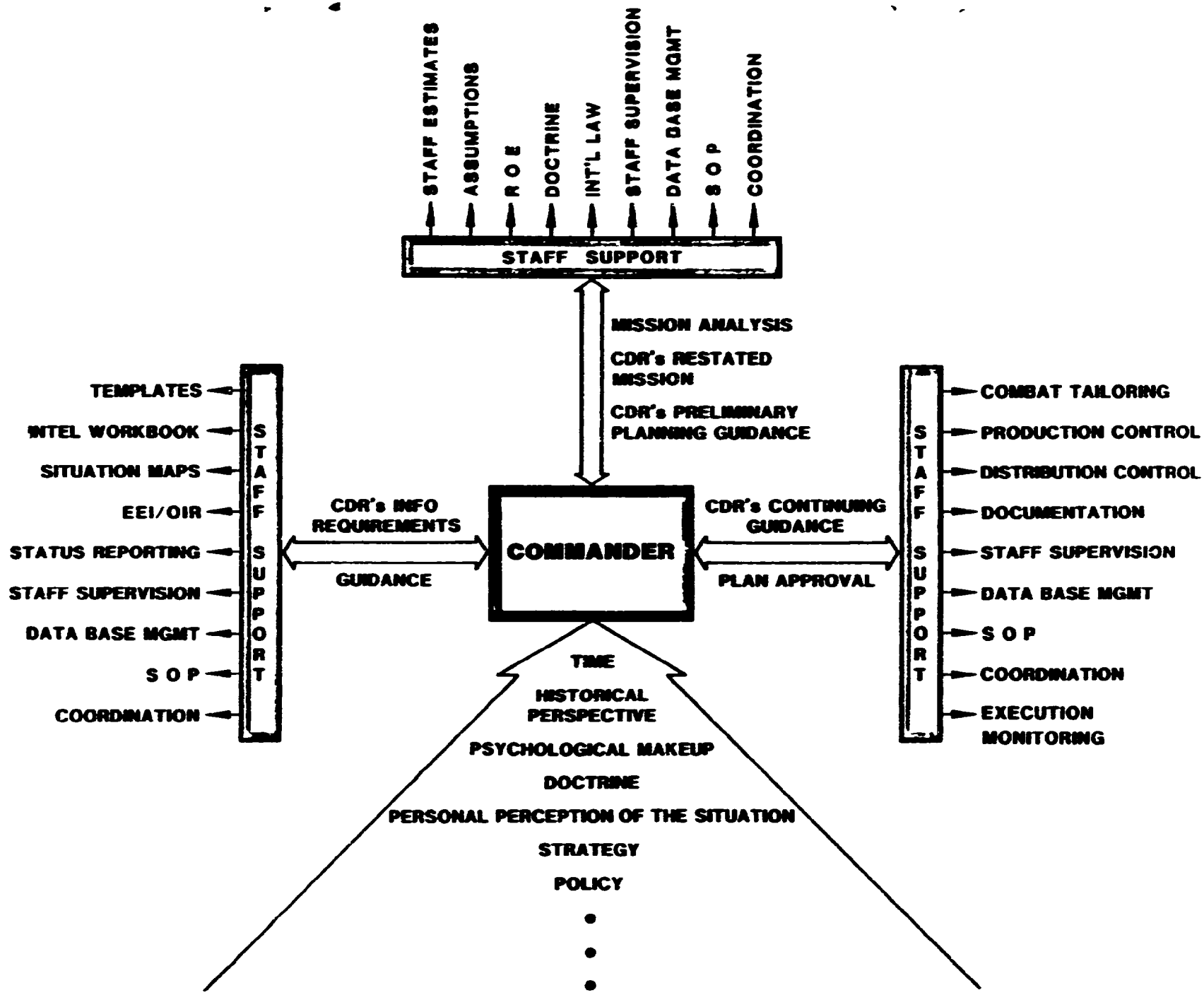

Figure 2
Commander and Staff Interactions